Quiz #4   Name: _____Key._____

You must show your work to get full credit.
Here is the mathematics behind radiocarbon dating. Willard Libby received the 1960 Nobel prize in chemistry figuring out how to do this and why it worked. This method is useful for dating organic samples that are not too old, say 20,000 years or less. The Wikipedia article on radiocarbon dating does a good job explaining the chemistry and physics that goes along with the mathematics.

Carbon 14, ^{14}C has a half life of 5,730 years.

1. Give a formula for the percent of ^{14}C left in t years.

$$A(t) = A_0 a^t$$

$$A(5730) = A_0 a^{5730} = \tfrac{1}{2} A_0$$

$$a^{5730} = .5$$

$$a = (.5)^\wedge (1/5730) = .999879$$

$$\underline{A_0 (.999879)^t}$$

2. If a sample has 70% of its original ^{14}C left, then how old is it?

We want to solve

$$A(t) = .7 A_0 \quad \text{for } t$$

$$A(t) = A_0 (.999879)^t = .7 A_0$$

$$(.999879)^t = .7$$

$$t \ln(.999879) = \ln(.7)$$

$$t = \ln(.7) / \ln(.999879)$$

$$= 2948.5$$

The age is _____2948.5   years_____